OUR ASTRONOMICAL COLUMN

THE TOTAL SOLAR ECLIPSE OF 1914, AUGUST 20–21.—There have been given in this column, at various times, particulars of the track of the central line in a number of the total eclipses of the sun that will occur during the next thirty years. To these may be added similar notes on the eclipse of August 20–21, 1914, which is a return of that of July 29, 1878, so extensively observed in the United States. The elements of this eclipse are very approximately as follow:—

G.M.T. of Conjunction in R.A. 1914, August 20, 23h. 55m. 3s.

	° ′ ″
R.A.	149 45 36·1
Moon's hourly motion in R.A. ...	33 7·5
Sun's ,, ,, ...	2 18·9
Moon's declination	13 9 42·2 N.
Sun's ,, ...	12 19 29·1 N.
Moon's hourly motion in declination	15 16·0 S.
Sun's ,, ,, ,, ...	49·7 S.
Moon's horizontal parallax	59 17·6
Sun's ,, ,, ...	8·7
Moon's geocentric semi-diameter ...	16 11·0
Sun's ,, ,, ,, ...	15 51·1

Hence it will be found that the

Total eclipse begins in long.	120° 42′ W.,	lat.	71° 21′ N.
,, ,, at 0h.	,,	2 0 E.	,,	70 42 N.
,, ,, ends	,,	70 26 E.	,,	23 52 N.

In traversing the European continent, the central line runs through the points

Long.		Lat.	Long.		Lat.
12° 33′ E.	...	65° 48′ N.	30° 33′ E.	...	50° 35′ N.
14 39 ,,	...	64 32 ,,	32 53 ,,	...	48 2 ,,
22 44 ,,	...	58 23 ,,	39 12 ,,	...	41 23 ,,
27 30 ,,	...	53 48 ,,	46 28 ,,	...	34 52 ,,

The first of these points is close upon the coast of Norway, at the Island of Alstahoug, and on making a direct calculation for it, the totality is found to commence at 0h. 54m. 19s. local mean time, continuing 1m. 59s., with the sun at an altitude of 37°, and this will be about the most favourable position for observation.

THE MINOR PLANETS.—That part of the *Berliner Astronomisches Jahrbuch* for 1887, containing its speciality, the ephemerides of the small planets for 1885, has been issued in advance of the publication of the volume. There are approximate places for every twentieth day of 237 out of the 244 now known, with accurately calculated opposition-ephemerides of 19. The most reliable elements of the orbits of these bodies to No. 237 inclusive are appended. *Æthra* continues at a distance of less than 1·0 from the earth until February 11, and if the orbit had been more closely determined, would have afforded a favourable opportunity of applying the method of finding the solar parallax suggested by Prof. Galle, as the planet has been a ninth magnitude at this opposition. *Eva*, *Stephania*, and *Agathe*, also approach the earth during the present year, within her mean distance from the sun; on August 10 *Stephania* will be at a distance of only 0·76, magnitude 11½.

Æthra has the least perihelion distance of the group, 1·604, while *Andromache*, with a considerable excentricity, has the greatest aphelion distance, 4·726, so that the orbits of the 244 planets extend over a space of 3·122, the earth's mean distance from the sun being taken as unity. The longest period of revolution occurs in the case of *Hilda*; it is yet doubtful which has the shortest period; No. 149 *Medusa* is credited with it at present, but until this member of the group has been re-observed, the point is perhaps doubtful. The most recently detected planet appears to have the shortest revolution next to *Medusa*, judging from the elements in the last circular of the *Berliner Jahrbuch*.

THE BRIGHTNESS OF SATURN.—Dr. G. Müller, of the Observatory at Potsdam, notifies in a recent number of the *Astronomische Nachrichten*, that since the year 1878 he has made regular photometric observations on Saturn, the main result of which he states to be, that when the earth is at an elevation of 26° above the plane of the ring, the planet's light is 2·4 times greater than when the earth is in that plane, or, in other words, that the brightness of Saturn's rings, when the earth is 26° from their plane, amounts to 58·3 per cent. of the brightness of the whole Saturnian system.

ENCKE'S COMET.—This comet appears to have been re-observed both in Europe and the United States; a somewhat doubtful observation by Dr. Tempel at Florence shows that the predicted elements will require probably but small correction. Taking aberration into account, the calculated position on December 13 differed from that observed, + 1′·1 in right ascension, and + 1′·2 in declination; the theoretical intensity of light on this date was 0·193. In 1852, when the perihelion passage occurred a week only later than in the present year, the comet was first observed on January 9, the intensity of light being 0·228.

GEOGRAPHICAL NOTES

THE lectures given under the auspices of the Paris Geographical Society last spring were so successful, that they are to be resumed this year. The first will be given by M. Janssen, on January 13, on the universal meridian. The others will be, by Prof. de Lapparent, on January 27, on the formation and development of the earth's crust; February 3, M. Bouquet de la Grye, the oceans; February 10, Dr. Hamy, man; March 3, M. Himly, the conquest of the globe; March 10, M. Levasseur, the riches of the globe; March 24, M. Louis Simonin, the great lines of navigation; March 31, M. Michel, railways and their relation to geography. These lectures are not free even to members, the charge for the course to such being fifteen francs, and twenty francs to outsiders. Some of the lectures will be illustrated with projections on the screen, and the success of the enterprise is so assured that a third series has already been arranged for in 1886.

MR. H. H. JOHNSTON writes as follows to the *Times*:—"The Kilimanjaro Expedition which I have just undertaken has resulted in a pleasant and healthy sojourn in one of the most beautiful and interesting regions in the world. I arrived at the mountain in the beginning of June, and settled first in Mandara's territory, on the southern slopes. Here I built a small town of about twenty houses and passed four months in collecting and making numberless excursions right and left. The climate was that of a Devonshire summer, provisions were abundant, cheap, and of great variety, and I was only fearful lest this delightful region might become to me a Capua, and deter me from the more important work that awaited me at a higher level than could be attained within the limits of Mandara's kingdom. Accordingly, when I had received from the coast a reinforcement of hardier men, I established myself at a height of 11,000 feet, and here built an even larger village than my settlement at Moshi. This was on a splendid site. A mountain torrent dashed past our circle of pretty thatched cottages, which surmounted a grassy knoll above the stream; to the south of us spread a wondrous prospect of sun-lit plains and distant rivers—a veritable map of Eastern Africa—and to the north rose the unspeakably grand summits of the mountain mass—Kibö, a dazzling dome of virgin white, and Kimawenzi, a piebald peak of black, jagged rocks, seamed and flecked with snow. From this settlement I constantly ascended as far as I was able in one day's journey, but the difficulties which lay in the way of a complete ascent of either peak arose from the impossibility of inducing any of my followers to accompany me beyond 14,000 feet, for above this altitude they suffered so keenly from cold and mountain sickness that no persuasion or bribes would induce them to ascend any higher, far less to carry any of my *impedimenta*. Consequently, I could never get beyond a certain distance from the settlement, the cold not permitting me to risk the chance of being benighted in the snow. I reached, however, an altitude of 16,200 feet, a little more than 2000 feet from the summit of Kibö, (18,800 feet high). I found warm springs at 14,400 feet, detected no signs of glacial action, and was somewhat disappointed with the paucity of plants growing at the snow line. Birds were very rare above 10,000 feet, and very abundant below. Lizards and chameleons existed (and frogs also) up to the very snow. Hyraxes (the hyrax is the coney of Scripture) were common between 8000 and 13,000 feet, and I fancy are represented by a new species. Buffaloes and elephants ascended to 14,000 feet. The thunderstorms that frequently rage round the upper slopes of the mountain are terrific, and the wind at times is so violent that no one can keep their feet. The natives who

inhabit Kilimanjaro up to 6000 feet, are fairly tractable, and have a passionate love of trade, which with them is the great pacifier. They go absolutely naked, or if any clothing is worn in the way of ornament it rarely goes beyond leather capes for the shoulders. They all speak dialects belonging to the great Bantu group of languages. I have studied carefully several of them, and have, I believe, discovered some most interesting points in their construction likely to throw considerable light on the archaic forms of Bantu prefixes. I may add that, after a very happy sojourn in the lovely forest region of Tavcita at the foot of the mountain, I was compelled to return most reluctantly to the coast at the end of November owing to the exhaustion of my funds. I left Kilimanjaro with great regret, and on my homeward journey my thoughts were persistently directed to my whilom African home, rather than to an unwilling and too early return to civilisation. My collections have safely reached this country, and will, I hope, be sufficient to indicate the true character and relationships of the fauna and flora of Kilimanjaro."

THE death is announced at Lübeck of Dr. Robert Avé-Lallemant, at one time a well-known traveller in South America. He became surgeon to the Novara expedition, which, however, he left at Rio, in order to devote himself to exploration in Brazil. In 1858 he went to Rio Grande do Sul, where he commenced his journey into Southern Brazil, during which he visited Bonpland, a few months before his death, in his lonely ranche in Paraguay. He crossed the Uruguay Allegrette, San Gabriel, and Cacupava to the Jacuy. From San José he went along the coast to Laguna, visited the sources of the Uruguay, and returned to San José through forests still unknown to travellers. This journey lasted about a year, and soon after his return he again set out to travel through the northern provinces. Landing at Bahia, he followed the coast to the Mucury river. Here he discovered the shocking condition of some of the German colonies. Thence he went to Pernambuco, and ascended the Amazon to Tabatinga, on the Peruvian frontier. On these journeys he published two large works ("Reise durch Süd Brasilien, 1859," and a similar work on North Brazil), and numerous smaller ones. They give no new geographical discoveries or exact measurements, or the results of scientific investigation, but they contain valuable information respecting the country, the fauna and flora, and condition of the people. The later years of his life were spent in medical practice in his native city.

ACCORDING to *L'Exploration*, the Argentine authorities are sending an expedition to the Chaco. It consists of 200 men, divided into three columns, operating from different points, but meeting at Cangayé, a centre almost equally distant from Salta and Paraguay. The object is both military and scientific. It is desired to secure the possession of this vast territory to the Argentine Republic against the Indians, who are again masters there. Six topographical commissions are attached to the expedition in order to study the country, prepare maps, and also, it is said, to investigate the possibility of a railway as far as Oran, in the province of Salta. The investigation of the rivers, for which the gunboat *Pilcomayo* is sent, has been delayed by the low state of the water, but recent rains will now enable that work to be proceeded with. If the result should be the demonstration of the suitability of the *Pilcomayo* to navigation, not only will a great service be rendered to topographical science, but by assuring communications between Bolivia and the Rio Paraguay, a great economical revolution will, it is expected, be produced in these regions.

EXPERIMENTS SUITABLE FOR ILLUSTRATING ELEMENTARY INSTRUCTION IN CHEMISTRY

PROFESSORS SIR H. E. ROSCOE and W. J. Russell, by direction of the Lords of the Committee of Council on Education, have recently prepared, for the assistance of teachers of science schools and classes, an outline of experiments in chemistry. As this subject is now under discussion, we are glad to be able to give the outline *in extenso* in NATURE.

The notes have been prepared as some guide to the teachers as to the general character of the course of instruction expected in the elementary stage; they include instruction that should on no account be omitted, but must be considered rather as suggestive than exhaustive.

I.—*Combustion and Chemical Combination*

1. Burn a taper in a clean glass bottle. Show the presence of a colourless gas, differing in properties from common air by yielding a turbidity with lime-water.

2. Hold a bright glass over a burning candle and show the formation of water.

Explain what is meant by chemical change, and state that chemistry is an experimental science.

3. Make similar experiments with a petroleum or paraffin lamp.

4. Show that coal-gas also yields the same products by passing the products of combustion through lime-water and by collecting the water.

5. Explain the difference between mechanical mixture and chemical combination; and illustrate by a mixture of finely-divided copper and flour of sulphur, and the effect of heat upon the same.

6. Experiment to show that chemical change consists of a change in the properties of matter and that no loss of matter takes place. Suspend lamp chimney, partly filled with lumps of caustic soda, from the arm of a balance. Place short piece of candle in the lower part of the glass and counterbalance. Light the candle. Explain the increase in weight.

7. Heat is evolved when chemical combination takes place. Pour water on to quicklime. Refer also to experiments 1 and 3.

8. Combustibles and supporters of combustion. The purely relative character of these terms. Ordinary combustion the union of atmospheric oxygen with a body termed the combustible, or with one or more of its constituents, heat being developed, as in all cases where two or more bodies combine. Illustrate by showing that air will burn in coal-gas just as well as coal-gas will burn in air.

II.—*Air*

1. Existence of atmosphere, felt in winds.

2. Weight of air shown by means of a flask exhausted by the air-pump.

3. Burn phosphorus in air.

4. Burn phosphorus in confined volume of air and show diminution in bulk.

5. Show that some diminution takes place slowly when a stick of phosphorus is exposed to air at ordinary temperatures.

6. Test residual gas (N) with a burning taper.

7. Show that phosphorus burnt in air increases in weight.

8. Allow iron borings moistened with sal ammoniac to rust in a confined volume of air and introduce burning taper into residual gas (N).

9. Show that iron filings, suspended by a magnet hanging on one scale of a balance, increase in weight on heating.

10. Strongly heat the red substance which may be formed by gently heating mercury in the air. Collect and test the gas (O) with a glowing splinter of wood.

11. Add the gas thus obtained to the residue obtained in experiment 4 or 8 so as to make up the original volume of air, and show that a taper burns in this mixture as in common air.

12. Refer to numbers giving exact analysis of air, calling especial attention to the fact that it varies slightly in composition.

Also explain that no obvious change, such as increase of temperature or alteration of bulk, occurs when oxygen and nitrogen are mixed. Also that air has the properties of a mixture, and that when water is shaken up with air a portion of that air dissolves, the residue being found to contain relatively less oxygen than the original air, whilst the dissolved portion contains relatively more oxygen, and that this could not be the case if the air were a compound. Consequently it is a mixture and not a chemical compound.

13. It is important that these experiments should be made and their explanation given so as to teach the student how the composition of air is ascertained by experiment, and in a similar manner how oxygen was discovered by Priestley, and how the composition of the air and the part which oxygen plays in the phenomena of combustion were experimentally demonstrated by Lavoisier.

III.—*Effects of Animal and Vegetable Life upon the Atmosphere*

1. Show that by drawing air into the lungs through lime-water a very faint, if any, precipitate is produced; but that on expiring air from the lungs through another portion of lime-water a copious precipitate is soon formed.